

Application No.: 10/696,048
Docket No.: PE0649 US DIV6

Page 5

REMARKS

Status of the Application

Claims 12-18 are pending in the application. Claims 12-18 stand rejected under 35 U.S.C. § 103.

Claim Rejections – 35 U.S.C. § 103

Claims 16-18

Claims 16-18 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Hamprecht, et al. (US 6,169,184) in view of Forrest, et al. (US 6,894,307) and Djurovich, et al., *Polymer Preprints*, Vol. 41 [2000] pages 770-771. Applicants respectfully traverse this rejection.

Hamprecht is directed to a process for preparing substituted phenylpyridines of Formula I with no teaching or suggestion that the phenylpyridines are useful in OLEDs. Djurovich discloses *fac*-tris[2-(4',5'-difluorophenyl)pyridine] iridium(III) ("FIrppy") as a component in a PVK based polymer blend LED. Forrest teaches the use of phenylpyridines as a "phosphorescent sensitizer" which acts as an intersystem crossing agent (Col. 9, lines 49-52) and is combined with a fluorescent emitter (dopant). The specific sensitizer molecule is *fac*-tris(2-phenylpyridine) iridium (denoted Ir(ppy)₃) (please see Col. 9, lines 65-67 and the formula at Col. 10, lines 1-10) and the specific example of the fluorescent emitter is DCM2 (please see Col. 10, lines 14-29). Claim 16 is drawn to an organic electronic layer of an electronic device comprising an Ir(III) compound made from precursor molecules having the structure shown which depicts 5-methyl-2-(2',4'-difluorophenyl)pyridine. In claim 17 the organic layer is a light-emitting layer and in claim 18 the organic layer is a charge transport layer.

As noted above, Hamprecht discloses synthetic processes for phenylpyridines without suggesting uses for the molecules in OLED layers or devices. Djurovich discloses one phenylpyridine, *fac*-tris[2-(4',5'-difluorophenyl)pyridine] iridium as a green emitting ($\lambda = 505$ nm emission peak) dopant used with PVK-PBD polymer blend host. Djurovich does not teach alternative placement of fluorine atoms on the phenyl ring or any substitution on the pyridine ring. The Examiner has suggested that it would have been obvious for one skilled in the art to have combined Forrest with Hamprecht and Djurovich to arrive at the subject matter set forth in claims 16-18. Forrest, however, teaches away from Hamprecht and Djurovich in two significant respects: (a) Forrest teaches that phenylpyridine is an intersystem crossing agent that, in Forrest's first embodiment, conserves triplets formed in the host material and transfers them to the singlet exciton of the fluorescent dopant according to equation 1,



wherein D and A represent, respectively, the donor (intersystem crossing agent) and acceptor (fluorescent dopant), the superscripts 3 and 1 represent, respectively, triplet and singlet states, and the asterisk indicates the excited state. (Col. 3, lines 22-38; Col. 9, line 49 to Col. 10, line

Application No.: 10/696,048
Docket No.: PE0649 US DIV6

Page 6

29) and (b) the only substitutions taught by Forrest are alkyl or aryl groups on either the pyridine or phenyl rings, or both (Col. 17, line 44 to Col. 18, line 27) and further, that the groups' placement is to be guided by steric (and not, for example, electronic) considerations.

Accordingly, Forrest teaches away from both Hamprecht and Djurovich by teaching that substituents may be the same on both the pyridine and phenyl rings, that in neither case is a fluorine atom an appropriate substituent, and that steric considerations control the identity and placement of the substituents. Djurovich teaches away from claims 16-18 by excluding an alkyl substituent on the pyridine ring and by demonstrating that the 4',5'-difluorophenyl specie is the only successful introduction of a phosphorescent emitter into PVK-based LEDs (p 770, Col. 2).

Taking the core teachings of these three references: (a) Hamprecht, molecular structures from disclosed synthetic pathways with no teaching or suggestion of utility in OLED layers or devices; (b) Djurovich, that a particular phenylpyridine is useful in polymer blend (PVD-PBD) LEDs; and (c) Forrest, that phenylpyridine is a sensitizer/ISC agent that improves efficiency of a fluorescent dye and may be substituted with alkyl and/or aryl groups to promote steric stability, there is no apparent motivation for combining the three references to arrive at the subject matter set forth in claims 16-18. Taking Hamprecht's Formula I, there is no reason why one skilled in the art would select the 5-methyl-2-(2',4'-difluorophenyl)-pyridine from among the myriad other possibilities as a starting material for Ir(III) complexes. Neither Djurovich nor Forrest suggest that this particular molecule would be an appropriate starting material or precursor for the claimed applications. Forrest does not teach the use of alkyl substituents on the pyridine ring in combination with fluorine substituents on the phenyl ring, and since Hamprecht hypothesizes no utility in OLEDs for the phenylpyridines identified therein, Forrest cannot confirm that certain combinations of substituents in Hamprechts's Formula I would be suitable, because there is no hypothesis to confirm. Even if one did begin with this particular molecule as a precursor, the combination of that molecule with Djurovich and Forrest would lead to contradictory trends for developing the material into a luminescent dye or a charge transporting agent. Djurovich does not teach alkyl or aryl substituents on either ring, rather, there are no substituents on the pyridine ring (except for the possible introduction of additional fluorine atoms). Forrest teaches alkyl or aryl substituents for steric viability, with no suggestion that halogen substituents would be effective or even desired. The uses to which Djurovich and Forrest put the phenylpyridines, Djurovich as a green phosphorescent in a polymer-blend LED and Forrest as an ISC agent combined with a fluorescent, would cast doubt on whether a combination of Djurovich's fluorinated phenyl ring and Forrest's alkylated pyridine ring would have any utility, at least not without undue experimentation with numerous different structural combinations.

Applicants respectfully submit that the only way these references can logically be combined to produce the subject matter of claims 16-18 is by hindsight reconstruction, which

Application No.: 10/696,048
Docket No.: PE0649 US DIV6

Page 7

has been criticized by the U.S. Court of Appeals for the Federal Circuit. *See Ex parte Obukowicz*, 27 USPQ2d 1063, 1065 (BPAI 1992) and authorities cited therein. For all of the foregoing reasons, Applicants respectfully request that this rejection be withdrawn.

Claims 12-15

Claims 12-15 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hamprecht, Forrest, and Djurovich and further in view of the communication by Dedeian, et al., in *Inorganic Chemistry* (Vol. 30, 1991, pp. 1685-87). Applicants restate their remarks, presented above, concerning the combination of Hamprecht, Forrest and Djurovich. Dedeian teaches the use of iridium phenylpyridine complexes as photoreducing agents.

Dedeian does not teach or suggest the use of these complexes in electronic devices. All of Dedeian's ligands are 4'-substituted except for one species, methoxyphenyl pyridine, which is 5'-substituted [that is, all of the substitutions are on the phenyl ring, none on the pyridine ring, (please see Dedeian, page 1686, paragraph bridging columns 1 and 2)]. Accordingly, Dedeian situates single alkyl, methoxy, fluoromethyl, or a fluorine atom in the 4' position, or a single methoxy group in the 5' position, with no corresponding substituents on the pyridine ring. All of applicants' species have an alkyl substituent on the pyridine ring (methyl or *t*-butyl) except for the 5'-trifluoromethyl and 4',6'-difluoro species. It would not have been *prima facie* obvious that a photoreductant would be an efficient component in an organic layer of an electronic device. Nor would their suitability in an emitting layer or charge transport layer in an electronic device have been obvious from Dedeian's disclosure of a limited number of species as strong photoreductants.

Applicants respectfully request that this rejection be withdrawn.

Conclusion

In view of the above amendments and remarks, it is respectfully submitted that the claims are now in condition for allowance. A Notice of Allowance is earnestly requested.

Applicants are submitting a petition for extension of time (3 months) concurrently with this paper, along with authorization for the USPTO to charge the fee for this extension to Deposit Account No. 04-1928 (E.I. du Pont de Nemours and Company).

Should the Examiner have any questions about the contents of this paper or the status of the application, he is welcome to call the undersigned at the telephone number listed below.

Application No.: 10/696,048
Docket No.: PE0649 US DIV6

Page 8

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